ORIGINAL ARTICLE

Predictors of Treatment Response and Length of Stay for Inpatients with Major Depression

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Background/Purpose: Depressive illness is highly recurrent, frequently chronic and associated with a high level of functional disability. Studies have shown that depression combined with anxiety is the most common reason for admission worldwide. This study aimed to examine the variables associated with treatment response or length of stay (LOS) among a group of inpatients with major depression.
Methods: The attending psychiatrist rated severity of depression (using the Hamilton Rating Scale for Depression, HAM-D) of the patients ($n = 67$), and the patients were asked to complete several self-rating scales (including the Beck Depression Inventory, BDI) on admission. Three days before discharge, these assessments were repeated. Logistic regression models were used to examine the variables of remission status (defined by the HAM-D or the BDI) and LOS (dichotomized by a median of 25 days), respectively.
Results: The remission rates of depression at discharge defined by the HAM-D (≤ 7) and the BDI (≤ 8) were 40% and 16%, respectively. Lower socioeconomic status and less clinical severity at admission were associated with clinicians' objective assessment of remission, while suicide attempt during this index episode was associated with patients' subjective remission. LOS of depressive inpatients was neither related to baseline severity nor to remission status at discharge. Patients with positive family history and more frequent hospitalization were associated with a hospital stay of longer than 25 days.
Conclusion: There was no evidence to show that patients with a long hospital stay would gain treatment benefits over patients with short stay. This study provides evidence to support that a structured inpatient treatment plan might gain some economic benefits without compromising treatment efficacy. The admission of hospitalization repeaters should be managed optimally based on the considerations of treatment efficacy and its impact on longer hospital stay. [*J Formos Med Assoc* 2007;106(11):903–910]

Key Words: hospitalization, length of stay, major depression, treatment response

Depressive illness is highly recurrent, frequently chronic and is associated with a high level of functional disability.[1] Large-scale statistical studies have shown that the number of patients with depressive disorder has increased vastly and depression combined with anxiety was the most common reason for admission worldwide in recent years.[2–4] Inpatient expenditures for treatment of depression and other affective disorders ranked in the top 10% of all disorders and first among psychiatric disorders.[5] Studies have reported that significant variation existed among inpatients' response to treatment. Variables reported to be associated with better treatment response included preadmission levels of functioning,[6,7] additional therapy received at hospital,[6,8] absence of organic brain syndrome,[6]

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less clinical severity,[7] patients' and psychiatrists' initial reactions at admission,[9] lower medical burden,[8] and shorter hospitalization.[6,8]

The topic of length of stay (LOS) within inpatient units has become increasingly relevant as external pressures for economic justification of each treatment modality included in the coverage of National Health Insurance in Taiwan has increased. Studies for trends in acute psychiatric inpatient care in recent years have shown declines in both LOS and readmission rate.[3] Unlike LOS in other medical fields, LOS in psychiatry is heavily influenced by demographic and socioeconomic characteristics, as well as hospital staffs' attitudes,[10] and is not readily viewed by practitioners as a meaningful index of clinical performance. Furthermore, extending an unnecessary hospital stay for a psychiatric patient may actually undermine the benefits of treatment.[10,11] Psychiatrists do not have a consensus on what is the optimal LOS and effective treatment for specific diagnoses; nor do we know the most cost-effective combination of in- and outpatient treatment for particular types of patients that might not produce a satisfactory outcome but can prevent adverse outcomes in a small minority of patients with complicating psychosocial problems. Studies that examined the factors influencing LOS within institutions found that LOS was related to diagnoses,[10,12,13] demographic variables,[12] suicidal potential,[14] level of psychopathology,[10,14] previous psychiatric hospitalization,[10,15] response to hospitalization,[13,16] and placement considerations.[12–14] Given the above-mentioned interplay between treatment response and LOS, both need to be assessed if we want to examine the optimality of inpatient treatment.

Some psychiatric literature discuss individual inpatient treatment plans and predictors of treatment response and LOS for a mixture of various psychiatric disorders.[6,10,12,17] In the few studies of depressive inpatients, the data have focused exclusively on the elderly population and used outcome assessment via the therapist's point of view.[8,13,14] A depressed patient usually has a limited ability to be aware of the general level of severity of his illness, while the clinician utilizes multiple cues in addition to a patient's verbal report to facilitate his/her judgment. A low concurrence between self-rating scales and observer-rating scales was found during the acute episode of depressive illness but generally improved at follow-up several months later when most of the patients recovered.[18] Self-report ratings from acutely depressed patients are not a reliable estimate of the severity of their symptoms.[18] It would be interesting to determine if the discrepancy of response evaluated by a self-rating scale and an observer-rating scale exists after acute inpatient treatment and the value of using a self-rating scale as a reference for discharge during the acute hospitalization. This study aimed to examine the variables associated with treatment response and those with LOS. We hypothesized that distinct predictors exist for treatment response evaluated by the observer-rating scale and the self-rating scale; remission status defined by the observer-rating measure would be more predictable by clinical and demographic variables than that defined by the self-rating measure. Furthermore, we hypothesized that patients with a longer course of hospitalization will not show significant improvement over those with shorter LOS.

Methods

Setting

Our psychosomatic ward is located in a university general hospital and was established in 1992. It is an open ward with 33 beds. Based on historical statistical records, the optimal LOS was considered to be 28 days or fewer, although this was not strictly followed. The mean number of hospitalization days from a total of 1832 admissions for a mixture of neurotic disorders from 1992 to 2000 was 27.7 ± 19.7 days.[19]

Subjects

The study subjects were 67 patients with a current episode of DSM-IV major depressive disorder (MDD) without psychotic features who were consecutively admitted to our ward from October

2000 to June 2001. No patients had episodes of hypomania or mania.

Measurements

Treatment response was measured using scales that had been introduced in a previously published paper regarding the intermediate-term outcome of the same group of patients.[20] They are only briefly mentioned here.

Two kinds of depressive scales were used in this study. One is the clinician-rated Hamilton Rating Scale for Depression (HAM-D-17).[21] The other is the self-rated Beck Depression Inventory (BDI).[22] Remission of depression was defined objectively as a HAM-D score ≤ 7 or subjectively as a BDI score ≤ 8.[23]

The Brief Psychiatric Symptom Rating Scale (BSRS) was modified from the Derogatis' Symptom Checklist-90-R (SCL-90-R)[24] and was designed to be used as a shorter form with 50 items. The BSRS is a satisfactory global measure and case-finding self-administered screening instrument for psychopathology in both psychiatric and non-psychiatric medical settings. The BSRS was calculated as a T score based on the mean scores of non-psychiatric medical inpatients throughout this study.[25] Only the depression and the General Severity Index (GSI) score are reported in this study.

The Global Assessment of Functioning (GAF) scale was used to report a clinician's judgment of a patient's overall level of functioning on a hypothetical continuum of mental health-illness.[26] The GAF is an example-anchored scale that provides a point score from 1 (lowest) to 100 (highest) describing a patient's lowest level of functioning. A GAF score > 80 indicates that patients had no or minimal symptoms with no more than everyday problems or concerns.

The Maudsley Personality Inventory (MPI) by Eysenck measures two aspects of personality characteristics: neuroticism and extroversion.[27] The Chinese version of the MPI has been demonstrated to have good psychometric properties and time stability in previous studies conducted in Taiwan.[28,29]

The Family APGAR index is a family function-screening questionnaire that measures participants' perception of five components of family function: adaptation, partnership, growth, affection, and resolve.[30,31] A higher score indicates a higher level of family support.

Procedure

For the purpose of assessment of determinants of treatment response and LOS, data including age at onset of depression, number of previous hospitalizations, duration of illness before index admission, family history of affective disorders, the presence of coexisting disorders, concomitant suicide attempt, and length of hospital stay were collected prospectively for each patient. The role of social environment in the etiology and course of major mental disorders involves two kinds of measures, i.e. socioeconomic status, referring to the ordering of persons along a continuum of economic, political or cultural attributes (income, educational achievement, occupational prestige) and social class, referring to social relationships of ownership and control over productive assets (owners, self-employed, worker, manager, supervisor, non-managerial employee).[32] Socioeconomic status is shown for quintile categories, class I to V, ordered from highest to lowest and based on education and occupation of key person in their family.[33] Social class defined according to the Standard Occupational Classification,[34] including nine major groups of occupation, is orderly ranked into three levels. The first three groups are labeled as level 1, the middle three groups are labeled as level 2, and last three groups are labeled as level 3.

During the first week of hospitalization, the attending psychiatrists rated severity of depression and functioning level of the hospitalized patients with the HAM-D and the GAF scale. Patients were also asked to complete the BDI, BSRS, MPI and Family APGAR. Three days before discharge, these assessments were repeated except for the MPI and Family APGAR.

Statistical analyses

Descriptive statistics were used to calculate basic demographic data. Paired *t* test was used to compare the psychometric scores (HAM-D, BDI, depression

and GSI scores of the BSRS, and GAF) between admission and discharge. The correlation of baseline psychometric scores with LOS was calculated using Pearson's correlation coefficient. The outcome variable of remission status at discharge was defined by HAM-D ≤ 7 and BDI ≤ 8, respectively. The variable of LOS was also dichotomized into long LOS and short LOS by a median of 25 days. All of the sociodemographic and clinical variables (including psychometric scores) listed in Tables 1 and 2 were examined using univariate logistic regression to determine if there was any relationship between these variables and outcome variable or LOS. If a significant bivariate relationship existed, two stepwise multivariate logistic regression analyses were performed to find independent predictors for remission status at discharge or long LOS. All data were analyzed using SPSS version 11.5 (SPSS Inc., Chicago, IL, USA) for Windows.

Results

Basic and clinical characteristics

The sociodemographic and clinical characteristics of the 67 study subjects are shown in Table 1. The majority of the patients were women ($n = 48$, 71.9%), and the mean age of the patients at admission was 49.2 ± 15.4 years. Thirty-one percent and 42% of the patients were in the upper (I & II) and middle (III) socioeconomic status categories respectively. Most of our patients were in good physical health and did not have significant cognitive impairment. One third had repeated hospitalization due to depressive episode ($n = 23$, 34%). Nine (13%) patients had first-degree relatives with affective disorders. Nearly 30% of the patients ($n = 19$, 28.4%) had made at least one suicide attempt at the index episode. Mean length of hospital stay was 25 days (range, 8–55 days).

Table 1. Sociodemographic and clinical characteristics of 67 inpatients with major depression

	Mean ± SD	*n* (%)
Sociodemographic variables		
Age at admission (yr)	49.2 ± 15.4	
Age ≥ 65 yr		12 (18)
Sex, female		48 (72)
Married		20 (30)
Education (yr)	10.5 ± 4.8	
Socioeconomic status		
I & II		21 (31)
III		28 (42)
IV & V		18 (27)
Employment		24 (37)
Living alone		6 (9)
Clinical variables		
Age at onset (yr)	44.0 ± 15.1	
First episode of depression		27 (40)
Duration of illness (yr)	5.0 ± 6.4	
Duration of current episode (mo)	6.0 ± 8.7	
Comorbid diagnoses		
Personality disorder		8 (12)
Medical diagnosis		26 (40)
Previous hospitalization ≥ 1		23 (34)
Suicide attempt at index episode		19 (30)
Family history of affective disorder		9 (13)
Length of stay (d)	25.3 ± 10.0	
≤ 25 d		35 (52.2)
> 25 d		32 (47.8)
Treatment with ECT		3 (5)
Treatment with antipsychotics		13 (19)

SD = standard deviation; ECT = electroconvulsive therapy.

Treatment response and predictors for remission status at discharge

The kind and dosage of antidepressants used in 67 patients included imipramine 160 ± 104 mg/day ($n = 5$), fluoxetine 31.5 ± 9.9 mg/day ($n = 8$), fluvoxamine 158.3 ± 46.3 mg/day ($n = 12$), paroxetine 39.5 ± 9.7 mg/day ($n = 19$), sertraline 100 ± 37.3 mg/day ($n = 19$), trazodone 200 mg/day ($n = 2$), venlafaxine 56 mg/day ($n = 1$), and moclobemide 300 mg/day ($n = 1$) (mean dosage for all patients was equivalent to imipramine 178.7 ± 64.7 mg, or fluoxetine 35.7 ± 12.9 mg/day) during hospitalization.[35] The scores of scales measuring clinical

Table 2. Psychometric scores at admission and discharge

	Admission	Discharge	Remission* at discharge, *n* (%)
HAM-D†	22.4 ± 7.5	7.7 ± 6.6	27 (40.3)
BDI†	31.9 ± 11.4	20.9 ± 12.4	11 (16.4)
BSRS			
Depression†	93.7 ± 21.2	73.7 ± 21.1	10 (14.9)
GSI†	91.0 ± 22.4	72.9 ± 22.6	10 (14.9)
GAF†	45.5 ± 11.1	69.8 ± 12.4	24 (35.7)
Family APGAR	5.7 ± 4.1		
MPI			
Neuroticism	15.0 ± 4.5		
Extroversion	12.0 ± 3.2		

**Remission was defined by HAM-D ≤ 7, BDI ≤ 8, depression score of BSRS ≤ 51, GSI of the BSRS ≤ 51 or GAF ≥ 80; †$p < 0.001$ between scores at admission and discharge. HAM-D = Hamilton Rating Scale for Depression; BDI = Beck Depression Inventory; BSRS = Brief Symptom Rating Scale; GSI = General Severity Index; GAF = Global Assessment of Functioning; Family APGAR = Family function in Adaptation, Partnership, Growth, Affection and Resolve; MPI = Maudsley Personality Inventory.*

severity and remission rates defined in different criteria are listed in Table 2. All scales showed significant improvement at discharge compared with at admission. Almost 80% of all patients responded to treatment (defined by HAM-D score < 50% of original score, $n = 53$). Forty percent achieved remission objectively (HAM-D ≤ 7, $n = 27$) and 16% achieved remission subjectively (BDI ≤ 8, $n = 11$) at discharge.

Clinical and sociodemographic factors significantly related to remission status at discharge (defined by the HAM-D) included sex ($p = 0.02$), socioeconomic status ($p = 0.006$), comorbid with medical diagnosis ($p = 0.02$), and severity indexes (GSI, $p = 0.01$; BDI, $p = 0.04$; HAM-D, $p = 0.006$; GAF, $p = 0.03$) by univariate analyses. Two variables showed borderline significance at $p = 0.05$ (APGAR and duration of illness). There were no differences in outcome status at discharge based on patients' age, marital status, age at onset of depression, family history of psychiatric illness, presence of personality disorder, treatment modality (combination of electroconvulsive therapy or antipsychotics), length of hospital stay (either as interval or categorical variable), and neuroticism score of the MPI. When all the variables exhibiting a significant association in the univariate analyses were included in multivariate logistic regression analysis, lower socioeconomic status, baseline GSI, and the HAM-D score remained significantly associated with remission status defined by the HAM-D at discharge. The final adjusted model correctly identified 80.6% of the cases. Meanwhile, suicide attempt at index episode ($p = 0.04$), baseline HAM-D ($p = 0.02$) and BDI ($p = 0.04$) were shown to be significantly related to remission status defined by the BDI at discharge. Only suicide attempt at index episode showed borderline significance with subjective remission after adjusting for other variables. The results of multivariate logistic regression analyses revealed distinct correlates of remission state rated by clinicians or patients themselves (Table 3). Using social class as an alternative measure of socioeconomic position came out the same variables associated with remission defined by the observer-rating scale (social class, odds ratio [OR] = 2.67, 95% confidence interval [CI] = 1.20–5.95; baseline GSI, OR = 0.96, 95% CI = 0.94–0.99; HAM-D score, OR = 0.89, 95% CI = 0.81–0.97).

Predictors for LOS

LOS did not show significant correlation with baseline severity (GSI: $\gamma = 0.13$, $p = 0.285$; HAM-D: $\gamma = 0.02$, $p = 0.90$) or with duration of current episode of depression ($\gamma = 0.05$, $p = 0.68$). Univariate

Table 3. Multiple logistic regression model predicting treatment response to acute inpatient treatment in 67 patients with major depression

	Beta	SE	*p*	OR	95% CI for OR
Remission status defined by HAM-D ≤ 7					
Socioeconomic status*	1.33	0.47	0.005	3.77	1.50–9.42
GSI at admission†	–0.04	0.03	0.01	0.96	0.93–0.99
HAM-D at admission†	–0.13	0.05	0.01	0.88	0.80–0.97
Remission status defined by BDI ≤ 8					
Suicide attempt at index episode‡	1.55	0.79	0.05	4.99	0.29–22.19

**Lower socioeconomic status (SES) increased the odds of being in remission at discharge (1 = upper SES, 2 = middle SES, 3 = lower SES); †higher scores at admission decreased the odds of being in remission at discharge; ‡presence of suicide attempt at index episode increased the odds of being in remission at discharge. SE = standard error; OR = odds ratio; CI = confidence interval.*

Table 4. Multiple logistic regression model predicting longer stay of 67 inpatients with major depression

	Beta	SE	*p*	OR	95% CI for OR
Number of hospitalizations*	0.84	0.41	0.04	2.32	1.05–5.13
Positive family history†	2.50	1.11	0.02	12.15	1.38–102.92

**More frequent hospitalization increased the odds of longer stay (> 25 days); †presence of family history increased the odds of longer stay (> 25 days). SE = standard error; OR = odds ratio; CI = confidence interval.*

analyses showed that positive family history of affective disorders ($p = 0.008$) and more frequent hospitalizations ($p = 0.03$) were significantly associated with LOS > 25 days. The association of these two variables still held to predict the probability of long LOS by stepwise logistic regression analysis, but with a wide 95% CI. ORs of previous hospitalization and positive family history were 2.32 (95% CI, 1.05–5.13) and 12.15 (95% CI, 1.38–106.92), respectively (Table 4).

Discussion

This study, using both objective (HAM-D) and subjective (BDI) methods of outcome assessment, found that the predictors for remission defined by these two assessments were distinct; lower socioeconomic status and less clinical severity at admission were associated with clinicians' objective assessment of remission, while only suicide attempt during this index episode showed borderline significant association with patients' subjective assessment of remission. The percentage of remission status defined by objective assessment (40%) was greater than that of remission defined by subjective assessment (15%), and variables associated with remission defined by clinicians' judgments were more predictable than those with remission defined by patients' subjective evaluations. LOS of depressive inpatients was neither related to baseline severity nor to remission at discharge. However, patients with positive family history and more frequent hospitalization were associated with hospital stay of longer than 25 days.

Our finding that baseline depression level was a negative predictor for observer-rated treatment outcome is consistent with another study.[7] However, another predictor that more patients with lower socioeconomic status will be discharged in a state of remission is counterintuitive, since low socioeconomic status was a negative predictor of depressive illness in this same group of patients at 1-year follow-up[20] and in a meta-analysis.[36] This might be explained by clinicians' concerns regarding the constraint of the resources of these patients after discharge; therefore, these patients with lower socioeconomic status tend to be discharged when they are approaching the

status of being symptom-free. Suicidal potential is often a contributor to LOS.[14] Although suicidal behaviors are sometimes deemed as manipulative attempts to gain or prolong admission, hospital staff fear premature discharge of a suicidal patient due in part to medicolegal considerations.[16] Interestingly, suicide attempt of the index episode was found to be the only variable associated with subjective remission at discharge in our study, which is contradictory to hospital staffs' anticipation of suicide risk mentioned above. Suicide act is frequently seen in patients with rapid mood fluctuation. It is speculated that the suicidal patients consisted of a heterogeneous group, and a subgroup of the suicidal patients (31.6%) with these characteristics rated themselves to be in remission at discharge more than those (10.4%) of patients without suicide attempt. The above findings demonstrate that clinicians cannot rely solely on patients' subjective reports to make decisions on whether or not to discharge patients.

Consistent with the result of Kirshner's review,[16] treatment outcome of hospitalization did not show any benefit in those patients with longer LOS in our study. Neither did LOS predict 1-year outcome of depressive status after discharge in a follow-up study of these patients.[20] Factors that were not measured in this study, such as patients' readiness to be discharged, various psychosocial factors influencing disposition and heterogeneous staffs' attitudes toward hospitalization, might be responsible for alternative explanations for LOS during psychiatric hospitalization. LOS will not have an association with treatment response unless the consensual guideline of inpatient treatment goal is established. Our study results provide preliminary evidence to support that a structured inpatient treatment plan, e.g. clinical pathway, might gain some economic benefits without compromising treatment efficacy and outcome of depressive inpatients. Our study showed that patients with a positive family history tended to stay in hospital for longer than 25 days. The other variable associated with long LOS was repeated hospitalization, and this finding is consistent with that of two previous studies.[10,15] When the results of this study and a follow-up study of the same patient group[20] were combined, it was found that repeated hospitalization was a negative predictor for both length of hospital stay and 1-year depressive status. Decisions for hospitalizing repeaters should be considered optimally based on the balance between treatment efficacy and its impact on longer hospital stay.

This study had some limitations. First, inpatient treatment modality was not controlled, and those placement considerations which might impede patients' discharge were not assessed. Second, some of the important variables were identified by patients' report (e.g. family history of affective illness). However, this information can represent in part the patient's concept toward his illness and is worth being referenced. Third, the relationship of those variables with treatment outcome was postulated by a limited case number. The power of prediction was not large enough to predict point estimate precisely.

In conclusion, our study found that 80% of depressive inpatients showed response and 40% of patients were in a state of remission after hospitalization for 25 days. There was no evidence to show that patients with long hospital stay would gain treatment benefits over patients with short stay. In contrast to remission that was rated objectively, no variable could be reliably identified with subjective remission. Psychiatrists should be aware of the characteristics of patients associated with long LOS and discuss inpatient treatment goals with patients to gain early participation on admission. Further studies with large sample size and assessment of pre-admission treatment history and psychosocial variables related with placement are needed to examine the effectiveness of combining in- and outpatient treatment for patients with major depression.

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